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What Do We Know About Hysterectomy?

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1. Introduction

A total hysterectomy is the most common type of gynecologic surgery and may be performed to treat many diseases that affect the uterus including: abnormal uterine bleeding, uterine fibroids, endometriosis and chronic pelvic pain, anatomic uterine defects, uterine prolapse and cancer (Reich, 2003). Based on German studies from 2005 and 2006 (overall 305 015 hysterectomies performed during the study period) the hysterectomy rate for benign diseases of the genital tract among women aged 20 or older (3.6 out of 1000 women) was higher than in Sweden but lower than in the US or Australia (Gupta, 2006, Stang 2011). The United States still has the highest incidence of hysterectomy, with about 550 000 women undergoing this operation annually, at a cost of more than $5 billion. The rate of this procedure in the USA is 5.4/1000 women, whereas in Italy it is 3.7/1000 and in Norway only 1.2/1000 women (Manyonda, 2003).

The hysterectomy can be done in different ways. These procedures can be performed using one of three main approaches: laparoscopic hysterectomy (LH), abdominal hysterectomy (AH) and vaginal hysterectomy (VH) (Clayton 2006). In laparoscopic, abdominal and vaginal hysterectomy can we removal of the uterus and cervix with/or without removal of ovaries. Table 1 show three main procedures of hysterectomy and surgery extension of female organs (tab.1).

Laparoscopic hysterectomy	**Abdominal hysterectomy**	**Vaginal hysterectomy**
Complete removal of the uterus and with/or without cervix with/or without removal of ovaries. Lymph nodes, ovaries and fallopian tubes can also be removed in this situation.	Removal of the uterus, cervix, upper vagina, and parametrium. Lymph nodes, ovaries and fallopian tubes can also be removed in this situation.	Removal of the uterus, cervix with/or without removal of ovaries

Table 1. Three main procedures of hysterectomy

The type of hysterectomy depends on the reason for the surgery and other factors for example age or general health condition and main disease and expertise, as the indications for each technique overlap. VH is probably the preferred route because it is quicker and cheaper than LH, with no other clear differences in outcome measures. LH has a number of advantages over AH like specifically, shorter hospital stay and quicker return to normal activities; complication rates, however, appear to be greater (Clayton 2006). In gynecological practice in the UK and the USA, 60–80% of all hysterectomies are performed by the abdominal route. In one of the German studies for all performed hysterectomies only 6% were laparoscopically assisted vaginal hysterectomies and 5% laparoscopic hysterectomies. 10% of laparoscopical hysterectomies and 1% of vaginal hysterectomies necessitated a conversion to an abdominal hysterectomy (Stang 2011).

There are three basic types of hysterectomy: total hysterectomy, supracervical also called subtotal or partial hysterectomy and radical hysterectomy. All these procedures can be conducted with or without the removal of the ovaries and the fallopian tubes on one or both sides (Tab. 2).

Total hysterectomy	**Subtotal hysterectomy**	**Radical hysterectomy**
Complete removal of the uterus and cervix with/or without removal of fallopian tubes and ovaries	Removal of the uterus, leaving the cervix with/or without removal of fallopian tubes and ovaries	Removal of the uterus, cervix, upper vagina, and parametrium. Lymph nodes, ovaries and fallopian tubes are also usually removed in this situation.

Table 2. Three basic types of hysterectomy

The ACOG (American Congress of Obstetricians and Gynecologists) has suggested that concomitant bilateral oophorectomy should be performed during the hysterectomy for benign uterine diseases in peri- and postmenopausal women. Strong consideration should be made for retaining normal ovaries in premenopausal women who are not at increased genetic risk of ovarian cancer. In Germany, 4% and 26% of all hysterectomies for benign diseases of the genital tract included bilateral oophorectomy among peri- and postmenopausal women respectively. The highest hysterectomy rates were among women aged 40–49 years (9.9 per 1,000 women) (Stang 2011). Twenty-six percent of hysterectomies for benign diseases among women aged 50 or older were bilateral oophorectomy. Another study conducted in the USA showed that 37% of hysterectomies among women with benign diseases of the genital tract aged 15–44 years were accompanied by bilateral oophorectomy.

2. Abdominal hysterectomy procedures

2.1 General information on abdominal hysterectomy procedures

A hysterectomy (from Greek ὑστέρα hystera "womb" and εκτομία ektomia "a cutting out of") is the surgical removal of the uterus. Hysterectomy is the second most commonly performed surgical procedure in the United States after cesarean delivery (Falcone, 2008). Hysterectomy is a common procedure in Australia; approximately 1 in 5 Australian women

undergoing a hysterectomy by the age of 50 for indications such as fibroids, disorders of menstruation (including excessive or irregular menstrual bleeding), and endometriosis (Graham, 2008).

In the management of early-stage cancer a radical hysterectomy can be performed (Panici, 2011). The most commonly used definition was proposed by Pivera, Rytledge'a and Smitha (tab.3). Five classes (class I–V) of extended hysterectomy were described. Class II and Class III are the most commonly employed (Piver 1974; Clayton 2006).

Type of surgery	Scope of procedure
Class 1	Outer facial surgical excision of the uterus. As a master of fact it is not a radical hysterectomy, it comprises only pushing the ureters away laterally without their preparation, which allows to clamp the vagina. The uterus is removed with an additional margin of the parametrium and the vagina.
Class 2	Excision of the uterus along with the primary ligament which is intersected centrally in relation to the ureter. Excision of the sacro-uterine ligaments in the middle of their length and 1/3 of the upper vagina.
Class 3	It assumes the intersection of the primary ligaments laterally from the ureter by the pelvic wall and the intersection of the sacro-uterine ligaments as close to the sacrum as possible, i.e. hysterectomy with the removal of the entire broad and sacro-uterine ligaments as well as 1/2 of the vagina.
Class 4	Excision of the uterus and the periuretal tissue, resection of the upper vesical artery 3/4 of the vagina
Class 5	Excision of the urinary bladder with distal ureteral segments.

Table 3. Types of operations according to Piver, Rytledge and Smith (Piver 1974)

Laparotomy is still considered the standard approach for radical hysterectomy; however, the total extraperitoneal abdominal radical hysterectomy (TEARH) has been described as a valid alternative for pelvic lymphadenectomy, with shorter operative time, shorter ileus and reduced postoperative pain and hospitalization (Panici, 2011).

2.2 Indications and contraindications

2.2.1 General indications for abdominal hysterectomy

General, noncancer indications for the abdominal surgeries of the removal of the uterus include: uterus "too big" or vagina "too narrow" (pubic arch < 90 degrees, bituberous diameter < 8.0 cm), uterus "too high" or "will not come down" also intra-abdominal conditions contraindicate vaginal approach (adhesions, endometriosis, adnexal disease, previous pelvic surgery, chronic pelvic pain, previous cesarean delivery) (Kovac, 2004; Learman, 2011). The indications for AH or VH in 2005 have changed little over the last decade, with uterine leiomyomata (33%) and being the most common, followed by prolapse (13%) and endometriosis (9%) (NIS 2007; Falcone 2008) . One should not forget that one of

the indications for hysterectomy is sex reassignment. The predictors of hysterectomy is also performs as a treatment for menstrual problems (Graham, 2008).

Indications for radical surgeries depend on the severity and type of tumour show the table (tab.4).

Type of surgery	Indications
Class 1	Preinvasive carcinoma, early invasion
Class 2	Neoplastic invasion greater than in class 1.
Class 3	Clinical severity 1b, 2a
Class 4	Neoplastic process involving the bladder and distal ureteral segments
Class 5	Neoplastic process involving the bladder and distal ureteral segments

Table 4. Types of surgeries

2.2.2 Obstetrical hysterectomy

Perinatal hysterectomy is the removal of the uterus immediately after delivery or caesarean section or up to 24 hours after delivery or cesarean section. It is a difficult procedure, performed rarely usually due to emergency indications, burdened with a high risk of postoperative complications. It is often a consequence of previously performed caesarean section and accompanying complications such as uterine rupture in the scar or bleeding from the villi of the placenta located on the front wall of the uterus, which grow into the scar (Poręba, 2007).

Flood et al. (Flood et all, 2009) was performed a retrospective cohort study from 1966-2005 of patients who had peripartum hysterectomy (PH). There were 872,379 deliveries during the study period, among which 358 women underwent PH (0.4/1000 deliveries). In a comparison of the study decades 1966-1975 with 1996-2005, peripartum hysterectomy decreased from 0.9 per 1000 deliveries to 0.2 of 1000 deliveries. Although the overall cesarean delivery rate has increased from 6-19% during these 2 decades, the percentage of peripartum hysterectomy that occurs in the setting of a previous cesarean delivery has increased from 27-57% ($P < .00001$). According to the authors, main indications for PH had changed significantly in this time period, with "uterine rupture" as the indication for peripatum hysterectomy decreasing from 40.5-9.3% ($P < .0001$) and placenta accreta as the indication increasing significantly from 5.4-46.5% ($P < .00001$) (Flood et all, 2009). Poręba et all. (Poręba et all,) had analysed 63 232 labours between 1980-2005. 10 317 deliveries were eventually managed by caesarean section, and the emergency peripartum hysterectomy was necessary in 39 cases after labour in Department of Gynecology and Obstetrics Medical University of Silesia in Poland. In the opinion of the researchers, peripartum and intraoperational haemorrhage being a result of uterine atony was the most frequent cause of emergency peripartum hysterectomy (Poręba et all,). Shellhaas et all (Shellhaas, 2009) were described a total of 186 cesarean hysterectomies (0.5%) which were performed from a cohort of 39,244 women who underwent cesarean delivery. The leading indications for hysterectomy were placenta accreta (38%) and uterine atony (34%). Of the hysterectomy cases with a diagnosis recorded as accreta, 18% accompanied a primary cesarean delivery

while 82% had a prior procedure ($p<0.001$). Of the hysterectomy cases with atony recorded as a diagnosis, 59% complicated primary cesarean delivery whereas 41% had a prior cesarean ($p< 0.001$). Major maternal complications of cesarean hysterectomy included transfusion of red blood cells (84%) and other blood products (34%), fever (11%), subsequent laparotomy (4%), ureteral injury (3%), and death (1.6%). Accreta hysterectomy cases were more likely than atony hysterectomy cases to require ureteral stents (14% versus 3%, $p=0.03$) and to instill sterile milk into the bladder (23% versus 8%, $p=0.02$) (Shellhaas, 2009). Peripatum hemorrhage remains a cause of significant maternal morbidity and mortality. Accurate diagnosis and appropriate management of obstetric hemorrhage can reduce maternal morbidity and mortality worldwide (Kuczkowski, 2009).

2.3 Complications of hysterectomy and the quality of life

Hysterectomy is one of the safest surgical procedures. Overall mortality rate is 0,5-2/1000. The complications are most common in women treated for uterine fibroids, within the group on which hysterectomy performed for benign gynecological indications and overall rate decreases with age (Manyonda, 2003).

The advantages of abdominal hysterectomy are: good access into the peritoneal cavity, wide access to the site of operation and easier technique to remove appendages. At the same time, this traditional method of hysterectomy has many disadvantages associated with abdominal incision and greater operational trauma (Barwijuk 2005).

The complications of hysterectomy may occur during the operation or a few days, weeks, or even years after the surgery. Intraoperative complications include: bladder and urethra injury, bowel injury and also vascular injury with bleeding that requires transfusion. Short-term complications are connected with vaginal and sometimes urinary infection. Long-term side effects of hysterectomy are fistula and bladder dysfunction or prolapse. Many women complain of chronic pain. These complications are more common after an abdominal hysterectomy.

One of the long-term complications of gynecological surgeries is urinary incontinence. The aim of the study conducted by Jędrzejczyk et al. (Jędrzejczyk, 2008) was to assess the prevalence of urinary incontinence after some gynecological-obstetrical surgeries and to specify the type of incontinence, depending on the type of surgery and its access, in groups of premenopausal and postmenopausal patients. It appears that abdominal and vaginal accesses equally predispose to stress urinary incontinence (SUI). After abdominal hysterectomy the most common is SUI, while after caesarean section mixed urinary incontinence (MUI). Urgent UI is more common after vaginal plastic surgeries than after abdominal surgeries (Jędrzejczyk, 2008). However, the proportion of patients with urinary incontinence is lower by 50% in patients after over cervical amputation than after hysterectomy, and thus it should be a reason to consider the possibility of limiting the scope of the surgery in postmenopausal patients in order to prevent urinary incontinence. Obviously, it requires providing thorough information about the prevention of cervical cancer and further regular cytological testing (Jędrzejczyk, 2008). Forsgren et al. (Forsgren, 2009) observed that the pelvic organ fistula surgery was four times more common in women after hysterectomy compared with women not having the procedure. The highest fistula rates were observed the first year after surgery (Forsgren, 2009).

In case of patients who cannot be operated in a preserving way due to their serious diseases, a new technique of radical hysterectomy which saves the vegetative nervous system (RHOUW) should be considered. *Nerve - sparing technique* reduces the number of side effects from the urinary tract, and enables to perform the surgery with the same extent as in traditional nerve-sparing radical hysterectomy, giving identical oncological results (Maas, 2005; Raspagliesi, 2003; Sakuragi, 2005; Fujii, 2007; Kalemli, 2005). A comparative study of Sakuragi et al. (Sakuragi, 2005) analyzing a group of patients who have had RHOUW and a group in which an attempt to perform this surgery failed, clearly shows that after one year of observation urinary incontinence and reduced sensation in the bladder has not occurred in the group after RHOUW, and appeared in 100% of patients after classic radical hysterectomy (Sakuragi, 2005). In addition, Sasaki et al (Sasaki, 1982) reported that radical hysterectomy was followed by the reduction of maximum urethral closure pressure, which was probably related to the damage of the abdominal nerve (Sasaki, 1982). A paper by Morgan et al. (Morgan, 2000) showing the relationship of the radical hysterectomy with urethral sphincter insufficiency (ISD) on the basis of leek point pressure (LPP) in the urodynamic study would confirm these findings (Morgan, 2000).

3. Laparoscopic hysterectomy

3.1 General information on laparoscopic hysterectomy procedures

Laparoscopic hysterectomy includes both vaginal excision of the uterus, where the endoscopic part of the surgery consists in releasing adhesions or intersecting some ligaments and uterine vessels, as well as a radical removal of the uterus with the parametrium, vaginal cuff, and the lymph nodes, where all operations are performed laparoscopically, and the extraction of the uterus takes place not through the vagina (Barwijuk, 2005; Lee, 2002).

The type of laparoscopic hysterectomy is usually defined by the extent of laparoscopic dissection performed during the procedure (LAVH, LH, TLH, Robot-assisted laparoscopic hysterectomy). Table 5 show the type of surgical technique on laparoscopic hysterectomy procedures.

The concept of laparoscopic hysterectomy is therefore not so wide. Each procedure in which the uterus is extracted from the abdominal cavity through the vagina is in fact a laparoscopically assisted vaginal hysterectomy – as in LAVH, or a laparoscopically assisted total vaginal hysterectomy - as in LATVH, or a laparoscopically assisted radical vaginal hysterectomy - as in LAVRH. Only LSH and LTH are laparoscopic hysterectomy surgeries, and in both cases the uterus is extracted by means of a laparoscopic morcellation.

3.2 Indications and contraindications for laparoscopic hysterectomy

The development of laparoscopy has made it an essential and irreplaceable element in modern gynaecology, both in the diagnostic and therapeutic process. Currently, the scope of laparoscopic surgeries is wide and includes almost all procedures performed by laparotomy, thus eliminating the consequences such as extensive postoperative scars (Malinowski, 2009). Nevertheless, the indications for different types of laparoscopic hysterectomy are different. Indications for various laparoscopic surgeries show table 6.

Type of surgical technique	Detailed scope of procedure
Laparoscopic Supracervical Hysterectomy	The technique of the procedure is based on cutting off ligamentum teres uteri and infundibulo-pelvicum or ovarian ligaments, intersection of both plaques of the broad ligament of the uterus, closure of the lumen of both uterine arteries, and cutting off the uterine body from the cervix. In the next stage, the uterine body is extracted from the peritoneal cavity using morcellator.
Laparoscopically Assisted Vaginal Hysterectomy	The technique of the operation is based on cutting off primary ligaments and uterosacral ligaments from the laparoscopic access and cutting off the uterus from the vaginal vault from the vaginal access.
Laparoscopic Total Hysterectomy	The uterus is cut off from the vaginal vault, the vaginal stump is stitched up and the preparation is extracted from the abdominal cavity by a morcellator.
Laparoscopic Total Radical Hysterectomy and Pelvic Lymphadenectomy	After removal of all levels of the pelvic lymph nodes, the next step is to remove the uterus through the abdominal wall.
Laparoscopically Asissted Total Vaginal Hysterectomy	All stages of the operation with cutting off the uterus from the vaginal vault are performed laparoscopically. The extraction of the preparation and stitching of the vaginal stump is conducted from the vaginal access.
Laparoscopically Assisted Radical Vaginal Hysterectomy	After removal of all levels of the lymph nodes, the next step of LARVH is to remove the uterus through the vagina. 2 types of operations are performed, depending on the extent: either like in type 2 according to Piver and Rutledge, or in a more radical way according to Schaut-Amreich. It is similar to hysterectomy conducted from the abdominal access, classified as type 3 according to Piver and Rutledge.

Table 5. Types of hysterectomy procedures using a laparoscope (Chapron, 1996; Parker, 2000; Dargent, 2001; Barwijuk, 2005; Lee, 2002, Vizza, 2011).

Kruijdenberg et al. (Kruijdenberg, 2011) reviewed current literature on total laparoscopic (TLRH) and robot assisted radical hysterectomy (RRH) with pelvic lymphadenectomy in the treatment of early stage cervical cancer. He analyzed 27 studies comprising 342 RRH patients and 914 TLRH patients. There was no statistical difference between the methods in terms of age, BMI or prior abdominal surgery. Estimated mean operative time, blood loss and number of lymph nodes retrieved did not statistically differ between the RRH and TLRH method. Less blood transfusions were needed in patients treated by RRH versus TLRH (5.4% vs 9.7%, $p<0.05$). Both methods were similar in respect to adjuvant chemo- or (chemo) radiation and recurrence rate. When complications were prioritized in severity, major post-operative complications where more frequent in RRH patients than in TLRH patients (9.6% vs 5.5%, $p<0.05$). The length of hospital stay was significantly shorter in RRH compared to TLRH treatment (3.3 versus 6.2 days respectively; $p=0.04$). According to the authors, robot-assisted and total laparoscopic radical hysterectomy appears to be equally adequate and feasible. RRH studies had small patient populations and further experience

Laparoscopic surgeries procedures	Indications for various laparoscopic surgeries
LSH	Symptomatic myomas of the uterus, overgrowth of the uterine mucosa, heavy uterine bleeding resistant to pharmacotherapy, adenomiosis and endometriosis, and pelvic pain syndrome
LAVH	Symptomatic myomas of the uterus, overgrowth of the uterine mucosa, heavy uterine bleeding resistant to pharmacotherapy, adenomiosis and endometriosis, and pelvic pain syndrome. Alternatively additionally extended by cervical pathologies, such as e.g. dysplasia and early neoplasia
LTH	Symptomatic myomas of the uterus, overgrowth of the uterine mucosa, heavy uterine bleeding resistant to pharmacotherapy, adenomiosis and endometriosis, and pelvic pain syndrome, alternatively additionally extended by cervical pathologies, such as e.g. dysplasia and early neoplasia. Patients who did not give birth and who have been diagnosed with uterine myomas with a diameter larger than 5 cm by ultrasonography, with the uterus weighing more than 300 g and with non-malignant lesions in appendages which accompany uterine pathology.
LATVH	Pelvic organ prolapse accompanying a main disease, requiring surgery and perineal laceration repair.
LARVH	It is performed exclusively in oncological indications, i.e. in the early stages of ovarian cancer, cervical cancer and endometrial cancer. Ovarian cancer is a controversial indication and many clinicians are of the opinion that in this case laparoscopy should be replaced with a radical abdominal surgery.
LRH	Can be performed in stage Ia2–Ib1 or less advanced node negative cervical cancer patients without compromising survival. The feasibility of LRH for more advanced patients needs further investigations.
TLRH	Can be safely performed in patients with stage IB2-IIB carcinoma of cervix after NACT, with advantages of minimal blood loss and morbidity (can be performed in stage IB2-IIB with complete clinical response after 3 courses of NACT with paclitaxel 175 mg/m2, ifosfamide 5 g/m2 and cisplatin 75 mg/m2.

Table. 6. Indications for various laparoscopic surgeries (Malinowski, 2009; El-Mowafi, 2004; Chapron, 1996; Parker, 2000; Reich, 1990 & 2003; Childers, 1992; Querleu, 1991; Skręt, 2003; Vizza, 2011; Yan, 2011).

beyond the learning curve phase may improve operative time and complication rate (Kruijdenberg, 2011). Yan et all (Yan, 2011) presented Twelve-year experience with laparoscopic radical hysterectomy and pelvic lymphadenectomy in the study of the morbidity, oncological outcome, and prognostic factors of cervical cancer patients treated with LRH. According to FIGO stage, the number of patients with stage Ia2, Ib1, Ib2, IIa, and

IIb was 2, 163, 34, 35, and 6, respectively. The authors suggests that the short-term follow-up in this study was not allow to draw a definitive conclusion on the impact of laparoscopic technique on the outcome. More multicenter studies and longterm follow-up were required to identify the oncologic outcomes of this procedure (Yan, 2011).

3.3 Complications of hysterectomy and the quality of life

A retrospective analysis Davies et all. (Davies, 2002) of 1000 consecutive hysterectomies showed that the overall complication rates were 34, 24 and 21% for abdominal, vaginal and laparoscopic hysterectomy, respectively. The results show that women undergoing hysterectomy for benign indications have a 1:3 to 1:5 chance of developing an operative or postoperative complication, most likely of minor nature (Davies, 2002).

Labrador et all. (Labrador, 2008) analyzed retrospective review of the medical records of 716 women who had a hysterectomy. Of the 716 hysterectomies, the abdominal (60.34%) route was the most common, followed by total laparoscopic hysterectomy (25.84%), vaginal hysterectomy (8.38%), Laparoscopic supracervical hysterectomy (3.77%), laparoscopically assisted vaginal hysterectomy (1.26%) and Subtotal abdominal hysterectomy (0.42%) routes. Patients were an average of 44 years. The 94.97% had benign indications and 5.03% have not benign indications. Mean operating time was 112 minutes for total abdominal hysterectomy, 113.13 minutes for Subtotal abdominal hysterectomy, 131.1 minutes for total laparoscopic hysterectomy, 103.73 minutes for Laparoscopic supracervical hysterectomy, 92.41 minutes for vaginal hysterectomy and 138.88 minutes for laparoscopically assisted vaginal hysterectomy. Blood loss was fewer in vaginal hysterectomies. They found that Laparoscopic supracervical hysterectomy and vaginal hysterectomy required less operative time and was associated with less blood loss. There were 7 conversions of surgery, 6 intraoperative bleeding, and 4 urinary tract injuries for total abdominal hysterectomy. For total laparoscopic hysterectomy there were 6 urinary tract injuries, and 5 conversion of surgery and 1 patient with intraoperative bleeding. Also, 1 patient had a bowel injury for vaginal hysterectomy. Blood loss was fewer in vaginal hysterectomies. They found that the most important complication was conversion of burgery (Labrador, 2008).

On the other hand the laparoscopic hysterectomy involves smaller incisions and is less painful. Moreover, the hospital stay after laparoscopic surgery may be shorter and the risk of infection is lower. Laparoscopic hysterectomy is also a feasible alternative to abdominal hysterectomy in obese patients weighing over 100 kg with low morbidity and fast recovery and short hospital stay. TLH is associated with significantly longer operative time and shorter hospital stay than VH. There is a trend towards more intraoperative and postoperative complications in the TLH group than in the VH group (McMaster-Fay, 2004).

The laparoscopic hysterectomy is associated with an increased risk of the urinary tract and bladder injury and of complications due to general anesthesia. In this retrospective cohort, body mass index does not affect surgical outcomes or increase complications during laparoscopic assisted hysterectomy. The complications of LAVH performed after prior laparotomy includes: damage of the urinary bladder, ureter, intestines and large blood vessels, bladder-vaginal and uretero-vaginal fistulas, bleeding from the vaginal stump,

postoperative ileus and empyemas of the pelvis. The incidence of these complications is estimated at 1.3-12%. Nevertheless, the efficacy of laparoscopy in patients with previous surgeries in the peritoneal cavity can amount to even up to 96.9% (Shen, 2003; Ballesta, 2003).

It is now widely recognized that in clinical research it is not sufficient to simply measure the outcome of a clinical intervention in terms of morbidity and mortality. Recent research presents compelling evidence that hysterectomy improves the quality of life. The study comparing abdominal or vaginal hysterectomy to endometrial ablative techniques has shown consistently higher quality of life scores for hysterectomy. On the other hand, retrospective studies suggest that abdominal and particularly vaginal hysterectomy may predispose to vault prolapse and the quality of life was lower in these patients compared to women after laparoscopic hysterectomy.

4. General information on vaginal hysterectomy procedures

4.1 Vaginal hysterectomy

The vaginal route of hysterectomy is considered as a first choice of all benign indications as the post-operative rates of morbidity and complications are lower than abdominal open hysterectomies according to the Society of Obstetricians and Gynaecologists of Canada (SOGC) clinical guidelines (Lefebvre 2002, Stang 2011). Abdominal hysterectomy involves removal of the uterus through an incision on the lower abdomen. Vaginal hysterectomy involves removal of the uterus via the vagina, with no abdominal incision. Vaginal hysterectomy should be performed in preference to abdominal hysterectomy, where possible. The ratio of vaginal hysterectomy (VH) to abdominal hysterectomy (AH) varies from 1:3 to 1:4 or less, depending on the country and surgeons' technique. This review found that vaginal hysterectomy meant quicker return to normal activities, fewer infections and episodes of raised temperature after surgery, and a shorter stay in hospital compared to abdominal hysterectomy (Nieboer, 2009; Sheth 2005).

4.2 Indications and contraindications for vaginal hysterectomy

There are well-defined indications for both VH. Table 7 present indications and contraindications for vaginal hysterectomy.

Although currently a standard surgery for endometrial cancer is abdominal hysterectomy with the excision of appendages and maintenance of oncological sterility, when the possibility of abdominal approach is limited (due to severe obesity or internal complications), vaginal hysterectomy can be recommended. However, it must be borne in mind that it limits the possibility of assessing the actual tumour stage (inability to remove the lymph nodes, palpate the small pelvic area and the abdominal cavity and to collect cytological smears or washings) (Łapińska-Szumczyk, 2009). A decision to resign from lymphadenectomy can be made provided that the patient is qualified into a group of low-risk recurrence of the disease: histological form of adenocarcinoma endometriale G1 or G2, in a situation when the carcinoma is present only in the endometrium or the depth of the infiltration does not exceed 50% of the uterine muscularis (Carey, 1995; Mariani, 2000).

Indications for vaginal hysterectomy	Contraindications for vaginal hysterectomy
1. Menorrhagia 2. Uterine fibroids 3. Genital and uterine prolapse 4. Neoplasia - Very early invasive cervical cancer - Carcinoma-in-situ of the cervix - Endometrial cancer 5. Endometrial complex hyperplasia with atypia 6. Recurrent postmenopausal bleeding 7. Chronic pelvic pain 8. Special indications - ventral scar hernioplasty - morbid obesity - high risk—e.g. interstitial lung disease which markedly restricts pulmonary function, poor cardiac status, obesity, diabetes, and hypertension - tuberculous abdomen - keloids 9. common - uterus 12 weeks or less in size or uterine volume 300 cm3 or less; - uterus is freely mobile; and - normal adnexa	1. Common - uterus more than 12 weeks' size or uterine volume more than 300 cm3 - restriction of uterine mobility - adnexal pathology. 2. Uncommon - cervix flush with the vagina - past Fothergill's operation - inaccessible cervix: uncommonly, after repeated uterine surgery, particularly past caesarean section, adhesions there are dense adhesions between the uterocervical surface, the bladder and the lower abdominal wall which makes the cervix inaccessible to an approach by the vaginal route - vesicovaginal and/or rectovaginal fistula repair - invasive cancer of the cervix.

Table. 7. Indications and contraindications for vaginal hysterectomy (Sheth, 2005)

4.3 Complications of hysterectomy and the quality of life

Nieboer et all (Nieboer, 2009) were included 34 studies with 4495 women. The benefits of VH versus AH were speedier return to normal activities (mean difference (MD) 9.5 days), fewer febrile episodes or unspecified infections (odds ratio (OR) 0.42), and shorter duration of hospital stay (MD 1.1 days). There was no evidence of benefits of LH versus VH and the operation time (MD 39.3 minutes) as well as substantial bleeding (OR 2.76) was increased in LH. For some important outcomes, the analyses were underpowered to detect important differences or they were simply not reported in trials (Nieboer, 2009).

Meta-analysis of these procedures shows that vaginal hysterectomy results in fewer complications than the other types of hysterectomy and is a very safe way to remove the uterus. VH is also associated with shorter hospital stay and faster return to normal activities than abdominal hysterectomy.

In another analysis, randomized, non-blinded, three-arm, controlled study it was revealed that the length of hospital stay was shorter by 0,9 day for vaginal hysterectomy and by 0,6 day for laparoscopic assisted vaginal hysterectomy in comparison with total abdominal hysterectomy. However the duration of the surgery was longer on average by 13 min for VH and 34 min for LAVH (Ottosen, 2000). Ottosen et all. suggested that LAVH might carry a

higher risk of conversion to abdominal hysterectomy than vaginal hysterectomy. But in opinion Summitt (Summitt, 2002) the relatively small numbers of subjects within each surgical group did not allow this conclusion to be made.

5. Economic analysis

Economic aspect can be difficult to assess because of the nature of healthcare systems in various countries.

6. Alternatives to hysterectomy

6.1 The levonorgestrel – Releasing intrauterine system (Mirena, LNG-IUS)

Conservative alternatives including the Mirena IUS. The levonorgestrel- releasing intrauterine system (Mirena, LNG-IUS) is effective in reducing menstrual blood loss and should be considered as an alternative to surgical treatment. Surgery, especially hysterectomy, reduces menstrual bleeding more than medical treatments at one year but LNG-IUS may be comparable in improving quality of life. The evidence for longer-term comparisons is weak and inconsistent. Oral medication suits a minority of women long term. Randomised controlled trials (RCTs) comparing conservative surgery or hysterectomy versus medical therapy (oral or intrauterine) for HMB. Twelve parallel-group RCTs that included 1049 women met the inclusion criteria. In comparisons of oral medication versus surgery, 58% of the women randomised to medical treatment had received surgery by two years. Compared to oral medication, endometrial resection was significantly more effective in controlling bleeding (at four months: RR 2.66 (95% CI 1.94 to 3.64); NNT = 2 (95% CI 2 to 3), one study) and hysterectomy resulted in significantly greater improvements in mental health (at six months: P = 0.04, one study). In comparisons of LNG-IUS versus conservative surgery or hysterectomy, at one year there was no statistically significant difference in satisfaction rates nor in most measures of quality of life, though adverse effects were significantly less likely with conservative surgery (RR 0.51 (95% CI 0.36 to 0.74); NNT = 4 (95% CI 3 to 7), three studies). Conservative surgery was significantly more effective than LNG-IUS in controlling bleeding at one year (RR 1.19 (95% CI 1.07 to 1.32); NNT = 7 (95% CI 5 to 19), five studies). Two small studies with longer follow up found no difference or favoured LNG-IUS, but both of these studies had skewed data and there were high losses to follow up. Hysterectomy stopped all bleeding but caused serious complications for some women (Marjoribanks, 2006).

6.2 Uterine artery embolization

Uterine artery embolization is also effective for fibroids and endometrial ablative techniques may be an effective therapy for menorrhagia. Uterine artery embolization (UAE) is helpful for uterine fibroids that cause symptoms such as heavy bleeding, pain, pressure symptoms and subfertility. The two main surgical approaches are myomectomy (hysteroscopic or abdominal approach) to remove the fibroids or hysterectomy where the uterus is removed: both are associated with complications. There were two randomized controlled trials (RCT) comparing UAE with hysterectomy and another comparing UAE with myomectomy. Two of these trials had a minimum of six months follow-up and the other is a peri- and postprocedural complications report for up to 6 weeks follow-up only. There was no evidence of benefit of UAE compared to surgery (hysterectomy / myomectomy) for

satisfaction. There were more minor complications, more unscheduled visits and readmission rates after discharge in the UAE group compared to hysterectomy. However, there were no differences between major complication rates and UAE is associated with shorter hospital stay and return to work. Further research was awaited with long term follow up. Women with symptomatic fibroids may be offered UAE as a treatment option but more research with a longer follow up is needed (Gupta, 2006).

6.3 Endometrial hyperplasia can sometimes be treated medically with progestins or destruction of endometrial tissue by either TCRE

Destruction of endometrial tissue by either TCRE (transcervical resection) or ablation is an effective alternative to hysterectomy for heavy menstrual bleeding (sometimes defined as a loss of 80mls or more of blood per menstrual cycle). Hysterectomy is effective in stopping HMB permanently, but also ends fertility and has all the risks of major surgery including infection and blood loss. Endometrial resection and other methods of ablation are less invasive methods of surgery that aim to remove the entire thickness of the endometrium (lining of the uterus). The Cochrane review of trials found TCRE or ablation is an effective and possibly cheaper alternative to hysterectomy with faster recovery although re-treatment is sometimes needed. There was a significant advantage in favour of hysterectomy in the improvement in HMB (OR=0.04, 0.01 to 0.2 at one year) and satisfaction rates (up to four years post surgery) (OR=0.5, 0.3 to 0.8 at 2 years) compared with endometrial ablation. Duration of surgery, hospital stay and recovery time were all shorter following TCRE or endometrial ablation, although these outcomes varied between trials. Most adverse events, both major and minor, were significantly more likely after hysterectomy and before discharge from hospital. After discharge from hospital, the only difference that was reported for this group was a higher rate of infection (OR=0.2, 0.1 to 0.5). Repeat surgery because of failure of the initial treatment, either endometrial ablation or hysterectomy, was more likely after endometrial ablation than hysterectomy (OR=16.7, 5.8 to 48.6). The total cost of endometrial destruction was significantly lower than the cost of hysterectomy but the difference between the two procedures narrowed over time because of the high cost of re-treatment in the endometrial destruction group (Lethaby, 1999).

7. Conclusions

- laparoscopic hysterectomy should be considered as an alternative to abdominal hysterectomy
- uterine fibroids are the most common indication for hysterectomy
- the decision to perform oophorectomy should be individualized
- subtotal hysterectomy has no advantage over total hysterectomy and might result in persistent cyclic bleeding
- conservative alternatives include the Mirena IUS and uterine artery embolization for fibroids and endometrial ablative techniques

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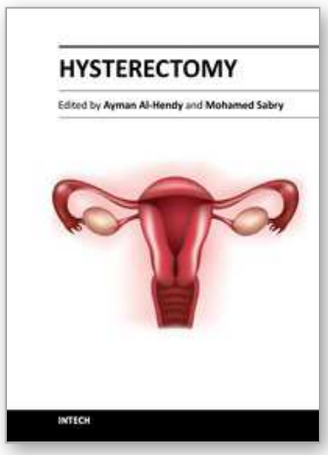

Hysterectomy

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This book is intended for the general and family practitioners, as well as for gynecologists, specialists in gynecological surgery, general surgeons, urologists and all other surgical specialists that perform procedures in or around the female pelvis, in addition to intensives and all other specialities and health care professionals who care for women before, during or after hysterectomy. The aim of this book is to review the recent achievements of the research community regarding the field of gynecologic surgery and hysterectomy as well as highlight future directions and where this field is heading. While no single volume can adequately cover the diversity of issues and facets in relation to such a common and important procedure such as hysterectomy, this book will attempt to address the pivotal topics especially in regards to safety, risk management as well as pre- and post-operative care.

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